REMARKS

Applicant has carefully considered the Examiner's comments in the Office Action mailed April 18, 2006. In response, Applicant has cancelled claims 32, 33, 36, and 37 without prejudice or disclaimer, leaving claims 17, 18, 24-30, 34, 35, and 38-42 pending in the application. Applicant reserves the right to pursue the canceled claims in a continuation application. Claims 17 and 34 have been amended. Support for these amendments can be found throughout the specification and figures. No new matter has been added. Applicant respectfully requests reconsideration and allowance of claims 17, 18, 24-30, 34, 35, and 38-42.

Examiner Interview

A telephone interview was conducted on July 7, 2006 between Examiner James Brittain and Applicant's representative, Mr. Brian Batzli (Reg. No. 32,960). Also attending the meeting was Ms. Julie Skoge (an attorney with Applicant's Attorney's firm). Applicant's claims 17, 32, and 34 were discussed in view of the cited references. The Examiner indicated that the Applicant's proposed amendments to claims 17 and 34 appeared to overcome the prior art, but that additional consideration was needed. Accordingly, no final agreement was reached.

Applicant has amended the claims above in response to the Examiner's comments during the Interview.

Claim Rejections

In the Office Action, claims 17, 18, 24-26, 28, and 30 were rejected under 35 U.S.C. 103(a) as being unpatentable over DE 3,017,371 (hereinafter "the '371 reference") in view of EP 311,828 to Dolezych (hereinafter "the '828 reference") and U.S. 5,832,569 to Berg (hereinafter "the '569 reference"). Applicant respectfully traverses the rejection and submits the rejection is overcome.

Claim 17 recites, in part, a bi-directional tensioning device including two plate members, a first support surface extending between the plate members, a first and second anchoring line attachment means, and a first and second guide means. The first guide means is configured to guide the threadable line under the first anchoring line attachment means and over the first guide means and over the blocking mechanism when the anchoring line is attached to the second anchoring line attachment means. The second guide means is configured to guide the threadable

line under the second anchoring line attachment means and over the second guide means when the anchoring line is attached to the first anchoring line attachment means.

In contrast, none of the cited references disclose or suggest a tensioning device including a first guide means configured to guide a threadable line under a first anchoring line attachment means and over a blocking mechanism when an anchoring line is attached to a second anchoring line attachment means and a second guide means configured to guide the threadable line under the second anchoring line attachment means and over the second guide means when the anchoring line is attached to the first anchoring line attachment means.

As noted by the rejection, the '371 reference lacks a clear showing of first and second guide means to aid in winding the threadable line. The '828 reference does not overcome the shortcomings of the '371 reference. The '828 reference does not disclose guide means spaced from anchoring line attachment means to guide a threadable line under the anchoring line attachment means and over the guide means. Rather, the '828 reference discloses bolts 26, 27 of smaller diameter arranged *beneath* the connection bolts 24, 25. See the translation of the '828 reference, page 4, lines 30-34. Moreover, a third bolt 2 is arranged near the blocking mechanism to guide the threadable line *beneath* the blocking mechanism and *beneath* the third bolt 2.

The '569 reference also does not overcome the shortcomings of the '371 and '828 references. The '569 reference does not disclose or suggest first and second guide means each configured to guide a threadable line under an anchoring line attachment means and over the guide means. Moreover, the '569 reference does not disclose or suggest guiding the threadable line over a blocking mechanism.

For at least these reasons, Applicant asserts the '371 reference would not lead a person having skill in the art to the invention of claim 17, even in view of the '828 reference and the '569 reference. Claims 18, 24-26, 28, and 30 depend from claim 17 and are allowable for at least the same reasons. Applicant respectfully requests reconsideration and allowance of claims 17, 18, 24-26, 28, and 30. Applicant does not otherwise concede the correctness of the rejection and reserves the right to make additional arguments if necessary.

Next in the Action, claims 27 and 29 were rejected under 35 U.S.C. 103(a) as being unpatentable over the '371 reference in view of the '828 reference and the '569 reference as

applied to claim 17, and further in view of U.S. 5,778,496 to Huang. Applicant respectfully traverse the rejection and assert the rejection is overcome.

Claims 27 and 29 depend from claim 17 and are allowable over the combination of the '371 reference, the '828 reference, and the '569 reference for at least the same reasons as discussed above with respect to claim 17. Huang does not overcome the shortcomings of these references. Huang discloses only one anchoring line attachment means and fails to disclose or suggest first and second guide means with each being configured to guide a threadable line under the respective anchoring line attachment means and over the guide means.

For at least these reasons, Applicant asserts the '371 reference would not lead a person having skill in the art to the invention of claims 27 and 29, even in view of the '828 reference, the '569 reference, and the '496 reference. Applicant respectfully requests reconsideration and allowance of claims 27 and 29. Applicant does not otherwise concede the correctness of the rejection and reserves the right to make additional arguments if necessary.

Claims 34-36, 38 and 40-42 were rejected under 35 U.S.C. 103(a) as being unpatenable over the '371 reference, the '828 reference, and U.S. 1,001,547 to McMillen (hereinafter "the '547 reference"). Claim 36 has been cancelled without prejudice or disclaimer, thereby rendering the rejection with respect to this claim moot. With respect to claims 34, 35, 38, and 40-42, Applicant traverses the rejection and respectfully asserts the rejection is overcome.

Claim 34 recites, in part, a bi-directional tensioning device including two plate members and a blocking mechanism operationally coupled to the plate members. The blocking mechanism includes a handle attached to a blocking pawl. The blocking pawl extends along a plane. The handle includes arms oriented to extend out of the plane of the blocking pawl to enable the handle to extend over a threadable line. The device also includes a first guide means and a second guide means. The first guide means is configured to guide the threadable line under the first anchoring line attachment member and over the first guide means and over the blocking pawl when the anchoring line is attached to the second anchoring line attachment member. The second guide means is configured to guide the threadable line under the second anchoring line attachment member and over the second guide means when the anchoring line is attached to the first anchoring line attachment member.

Applicant asserts claim 34 is allowable over the '371 reference and the '828 reference for at least the same reasons as discussed above with respect to claim 17. The '547 reference does not overcome the shortcomings of the combination of the '371 and the '828 references. The '547 reference is directed to a wire stretcher having only one anchoring line attachment means. The '547 reference does not disclose or suggest guide means configured to guide a threadable line under an anchoring line attachment means and over the guide means.

In addition, none of the cited references disclose or suggest a blocking mechanism including a handle attached to a blocking pawl where the blocking pawl extends along a plane and the handle includes arms oriented to extend out of the plane of the blocking pawl to enable the handle to extend over a threadable line. While the '547 reference discloses a handle on a blocking mechanism, the disclosed handle includes an eyebolt extending along the plane of the blocking mechanism and not out of the plane. The disclosed handle also does not extend over a threadable line. In fact, the disclosed handle is located on an opposite side of the wire stretcher from the threadable line.

For at least these reasons, Applicant asserts the '371 reference would not lead a person having skill in the art to the invention of claim 34, even in view of the '828 reference, and the '547 reference. Claims 35, 38 and 40-42 depend from claim 34 and are allowable for at least the same reasons. Applicant respectfully requests reconsideration and allowance of claims 34, 35, 38, and 40-42. Applicant does not otherwise concede the correctness of the rejection and reserves the right to make additional arguments if necessary.

Claim 39 was rejected under 35 U.S.C. 103(a) as being unpatentable over the '371 reference in view of the '828 reference and the '547 reference as applied to claim 34 above, and further in view of U.S. 4,584,742 to Speich (hereinafter "the '742 reference"). Applicant traverses the rejection and respectfully asserts the rejection is overcome.

Claim 39 depends from claim 34 and is allowable over the combination of the '371 reference, the '828 reference, and the '547 reference for at least the same reasons as discussed above with respect to claim 34. The '742 reference does not overcome the shortcomings of the '371 reference, the '828 reference, and the '547 reference. The '742 reference does not disclose or suggest guide means configured to guide a threadable line under an anchoring line attachment means and over the guide means.

For at least these reasons, Applicant asserts the '371 reference would not lead a person having skill in the art to the invention of claim 39, even in view of the '828 reference, the '547 reference, and the '742 reference. Applicant respectfully requests reconsideration and allowance of claim 39. Applicant does not otherwise concede the correctness of the rejection and reserves the right to make additional arguments if necessary.

Claim 37 was rejected under 35 U.S.C. 103(a) as being unpatentable over the '371 reference in view of the '828 reference and the '547 reference as applied to claim 34, and further in view of the '569 reference. Claim 37 has been cancelled without prejudice or disclaimer, thereby rendering the rejection moot. Applicant does not otherwise concede the correctness of the rejection and reserves the right to make additional arguments if necessary.

Claims 32 and 33 was rejected under 35 U.S.C. 103(a) as being unpatentable over the '547 reference in view of the U.S. 1,287,050 to Kranz (hereinafter "the '050 reference"), and the '828 reference. Claims 32 and 33 have been cancelled without prejudice or disclaimer, thereby rendering the rejection moot. Applicant does not otherwise concede the correctness of the rejection and reserves the right to make additional arguments if necessary.

Translations of Prior Art

Applicant has enclosed herewith copies of English language translations of the DE 3,017,371 reference and the EP 311,828 reference for the Examiner's review. Applicant will submit a Supplemental IDS for such references shortly.

Conclusion

In view of the above amendments and remarks, Applicant respectfully requests a Notice of Allowance. If the Examiner believes a telephone conference would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.

Respectfully submitted,

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(54) RATCHET FOR TIGHTENING, ESPECIALLY OF LASHING STRAPS

(57) The invention relates to a ratchet for tightening, especially of lashing straps, with a frame part having a pair of side pieces arranged normally spaced-apart at both sides of a bridge element formed as one piece with the side pieces, which side pieces have bores for the rotationally-movable support of a strap windup shaft with a slot, which strap windup shaft work together with, on the one hand, a swingable drive hand-lever and, on the other hand, with ratchet wheel lock, wherein each support bore is formed at the top and toward the outside with a divided-circle shaped guide link for a pawl that is displaceably arranged in the drive hand-lever, and in the frame part a likewise displaceably-arranged reverse-motion locking pawl is present,
characterized in that,
the side pieces (1a, 1b) are connected fixedly to each other at the frame part (10 without arrangement of the single-piece bridge element, but rather through at least two space-retaining elements (2, 3) formed as multiple pieces with the side pieces (1a, 1b).

EP 0 311 828 A2

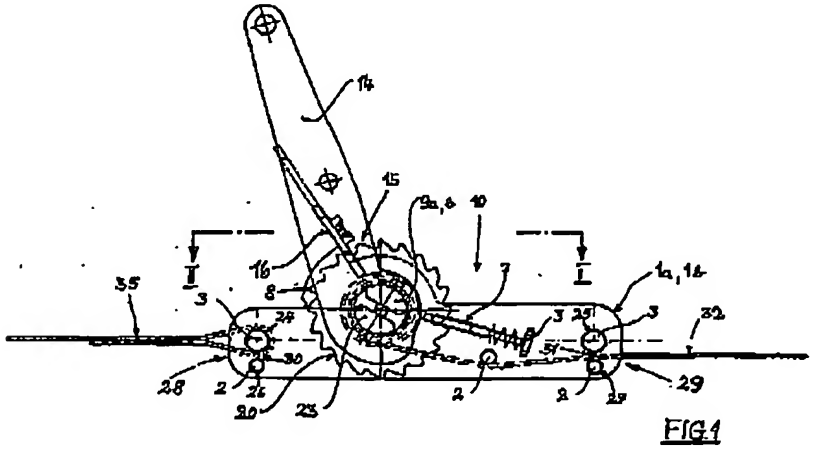


FIG 1

RATCHET FOR TIGHTENING, ESPECIALLY OF LASHING STRAPS

The invention relates to a ratchet for tightening, especially of lashing straps, with a frame part having a pair of side pieces arranged normally spaced-apart at both sides of a bridge element formed as one piece with the side pieces, which side pieces have bores for the rotationally-movable support of a strap-winding shaft with a slot, which shaft works together with, on the one hand, a swingable actuating hand-lever, and on the other hand, with a ratchet wheel catch, wherein each support bore is formed at the top and toward the outside with a divided-circle shaped guide link for a pawl displaceably arranged in the actuating hand-lever, and in the frame part a likewise displaceably-arranged reverse-motion locking pawl is present.

A ratchet of the type specified above is referred to as a tension lock for belt straps.

A tensioning device or ratchet or tension lock of the above-stated type is known, for example, from US Patent Specification 4,199,182.

In the known device, a locking member is associated with the locking teeth of the ratchet wheel, which locking member consists of a single locking pawl. The number of the teeth on ratchet wheels, as is learned from this publication, is limited for reasons of strength. They normally amount to 11 (eleven) and thus correspond to a tooth distribution with an angle of approximately 33°.

A distribution angle of this size prevents, in many cases, the actual attaining of the greatest possible tensioning force in the lashing strap through actuation by means of the hand power of the hand lever arranged as the driving organ, because in order to engage the locking pawl with the most remote reachable locking tooth of the ratchet wheel, it would still be necessary to carry out a movement step that far exceeds the available hand power of the user. Here, then, only a tooth that stands further back in the drive-rotation direction can be engaged, and in the most unfavorable case a slackening of the ratchet wheel and thus of the achievable strap tension through the winding shaft occurs, up to approximately the movement step of one tooth angle. The maximally achievable tension moment is thus not even close to being attained.

A tensioning device of the type stated at the beginning is further known from DE-PS

32 03 750.

In this known device, as well as in a multitude of similar ratchets and tension locks known in the prior art and commercially available, the tension lock consists of a frame in the form of a U-shape-canted profiled sheet metal with a relatively short base and two U-legs projecting beyond this base forward and backward, into one end of which a crosspiece or bolt is inserted via aligned bores, which crosspiece or bolt, normally with an intermediate layer of a small tube spacer, connects the legs to each other via a screw connection or a riveted joint in a spaced apart, parallel manner.

In the known strap ratchets or tension locks, this bolt forms at one end of the frame a strap connection for a strap end assembled with a loop.

At the other end, the frame formed with a U-shaped bridge is then provided with aligning support bores for the slotted strap wind-up shaft, into which a loop-free strap end is inserted and, through winding onto the the winding shaft, is first fastened and subsequently tightened.

Disadvantageous in this generally conventional design that is established as standard in practice is the fact that the clamping direction of the ratchet in the strap path is fixed in the above-mentioned arrangement of the strap connections in such a way that in each case the loop-free strap end must be connected to the to the end of the frame having the winding shaft and the strap end provided with a loop must be connected to the opposite end of the frame. A reversal of the ratchet body is thus not possible with the known design of the ratchet.

Thus, the case can arise in which, during the lashing down of a parcel, the driving lever, working together with the ratchet-wheel lock, is located in an unfavorable position. This is because, depending on the position in which the lashing means, strap, their catch point on the vehicle, and the ratchet are situated in relation to, on the one hand, the position of the good to be lashed, and on the other hand, to the position of the operating person, this person, for example standing at street level, can actuate the ratchet better, with respect to ergonomics, through pulling down with raised hands while standing, the ratchet being above head level on the vehicle, or, for example, standing on the pallet, can actuate the ratchet better in an

ergonomic respect through pulling the lever up from a bent-torso position.

Consequently, the use of a ratchet that is non-reversible in its association with the different strap ends necessarily leads to ergonomically unfavorable situations. Through this, considerable problems can arise during the lashing down, since the necessary lashing tension is not achieved.

Starting from the named prior art, the invention is based on the task of improving a ratchet of the type in question in such a way that it makes possible, in all occurring application cases, an ergonomically optimal actuation in order to achieve the greatest possible tension force, through being attachable to the strap ends in a selective manner in each case, such that an actuation can always be carried out, to the greatest possible extent, through application of the full body weight.

Further, the achievement of the highest possible tension forces should also be additionally improved through the fact that, instead of the hitherto usual tooth distribution angle of approximately 33°, a substantially smaller tooth distribution angle in the ratchet wheel lock is made possible, without thereby reducing the necessary strength and/or reliability of the lock.

Finally, the invention aims at an arrangement of the device that is as uncomplicated as possible, which device should preferably be suitable in a special manner for economical production from stampings even for relatively small to medium serial-piece numbers.

With the invention, the solution of the stated task is successful, in the case of a ratchet, of the type named in the preamble, for tightening, especially of lashing straps, through the fact that the side pieces, with arrangement of the one-piece bridge element, are fixedly connected to each other at the frame part through at least two multipiece space-retaining elements.

Advantageously, through the elimination of the bridge element between the side pieces, generally standard in the prior art, as well as through the connection of the side pieces through multipiece space-retaining elements, the accessibility of the insertion slot of the strap winding shaft is substantially improved, and this in such a

way that a loop-free end can be inserted without difficulty into the slot of the winding shaft from each of the two ends of the frame part or rather of the side pieces.

Thus, for the first time the invention offers the possibility of connecting the strap ratchet between a loop-free strap end and a strap end with a loop in every case independently of the arrangement of the ratchet, in such a way that the actuating lever, in cooperation with the ratchet wheel lock, is available in an ergonomically favorable position that allows the user to use his full body weight, in addition to his muscle power, during the actuation of the actuating lever.

However, the elimination of the usual bridge element between the side pieces, present in the prior art, also results in a significant reduction of the tool expense necessary in the production for the corresponding stampings. For example, now necessary for the design of the frame part according to the invention are two identical stampings that can be stamped out of strip stock with relatively little material waste. With the reduction of the blank surface, however, not only does the tool become smaller and thus more economical, but also the cutting pressure is reduced and thus a substantially smaller stamping press is needed, the operating costs of which are likewise lower. At the same time, such smaller presses operate with a comparatively very much quicker work cycle, so that for that reason too the production costs are reduced.

Thus, through the design according to the invention, in addition to the improvement in the application area, production costs are saved and the possibility arises of a very economical manufacturing even in the case of small or medium production-lot sizes.

Further improvements of the inventive object result from embodiments in detail corresponding to the features of claims 2 through 11.

Here, for the free choice of the clamping direction of the ratchet between two strap ends with different end equipment, it is of essential importance to the invention that the side pieces display connection bolts at both ends, as well as that underneath each of the connection bolts is arranged in each case a second bolt, forming a guide slot for the strap, the second bolt being spaced apart in a parallel manner.

Further, of essential advantage to the invention, in cooperation with the above-stated features, is the design of the ratchet wheel of the ratchet wheel lock, in which the diameter ratio of the shell circle to the root circle of the teeth is between 1.1 and 1.2, preferably 1.16666.

Through this means it becomes possible for the angular distance from tooth to tooth to be between 15 and 18 angular degrees, whereas this distance, as mentioned, is usually approximately 33° in the case of the prior art.

This narrower tooth distribution is made possible through an increase in the number of teeth to 24 or 20 teeth, as the case may be, in the ratchet wheel, and this in turn through an increase of the ratchet wheel diameter, which is achieved through the fact that, according to claim 9 of the inventive object, the center point of the support bore of the winding-shaft support is arranged on a line x-x that runs at substantially the height of the top edge of the side piece.

A further improvement essential to the invention is achieved according to claim 10 through the fact that the guide link, which normally displays at one end of its divided-circle shaped form a catch recess for fixing the actuating hand-lever in the neutral position when the lock of the winding shaft is released by means of the pawl, according to the invention displays also at the other end of its divided-circle shaped form a second catch recess for fixing the actuating hand-lever in its actuating end-position.

Through this means, the hand lever can be fixedly engaged in either of its end positions, which, in consideration of the reversibility of the ratchet in the strap running direction achievable with the invention, is especially advantageous.

The invention is shown in schematic drawings in a preferred embodiment form, and further advantageous details of the invention can be learned from the drawings.

The drawings show in detail:

Fig. 1: a ratchet in side view;
Fig. 2: the ratchet according to Fig. 1 in plan view of a plane II-II in Fig. 1;
Fig. 3: a side view of a side piece of a ratchet according to Fig. 1;

Fig. 4: a ratchet wheel of a ratchet according to Fig. 1, in side view.

The ratchet, represented in Fig. 1 in side view, for tightening of lashing straps displays a frame part 10, which is formed substantially of a pair of side pieces 1a, 1b arranged in a spaced-apart manner. These side pieces display bores 9a, 9b for the rotationally-movable support of a strap winding shaft 23 as well as of a actuating hand-lever 14 that is in turn supported on this shaft 23.

Working together with the strap winding shaft 23 is a ratchet wheel lock 15, which includes a ratchet wheel 20 and a pawl 16 arranged displaceably in the actuating hand-lever 14, as well as a reverse-motion locking pawl 7 likewise arranged displaceably in the frame part 10.

The bores 9a, 9b are formed at the top and toward the outside with a divided-circle shaped guide link 12a, 12b for the pawl 16 that is displaceably arranged in the actuating hand-lever 14.

Whereas in the prior art - as mentioned - it is conventional and has become generally established to connect the two side pieces 1a, 1b of the frame part 10 of a ratchet in a U-shaped manner through a bridge element formed as a single-piece with the side pieces, in deviation from this standard structure the inventive object is designed such that the side walls 1a, 1b are fixedly connected to each other on the frame part 10 without arrangement of a single-piece bridge element of this type, but rather by means of at least two space-retaining elements 2, 3 formed as multiple pieces with the side walls 1a, 1b.

As can be learned from a viewing together of Figs. 1 and 3, as a consequence of the elimination of the bridge element the side pieces 1a, 1b are designed in an especially uncomplicated manner in their shaping, and consist essentially of strip-shaped lower formed part 33 with the guide link 12a, 12b enclosing the bore 9a, 9a in a one-piece manner at the top.

Also as a consequence of the absence of the bridge element between the side pieces 1a, 1b, the diameter of the ratchet-wheel shell circle can now be designed considerably larger than it can be in the known ratchets.

Thus, for example, the diameter of the shell circle 20 (Fig. 4) corresponds to double the width (= 2B) of the strip-shaped formed part 33 of a side piece 1a, 1b.

A further serious and thus invention-essential advantage results also from the elimination of a bridge element in that, in accordance with the representation in Fig. 1, a loop-free strap end 32 can now be inserted into the ratchet also from the side of the frame part 10 displaying the reverse-motion locking pawl 7 and can be rolled up around the strap winding shaft 23 after insertion into the slot of the latter.

This was, for practical purposes, impossible until now with the presence of a U-shaped bridge element between the side pieces 1a, 1b of the frame part 10.

In an embodiment, the space-retaining elements 2, 3 are fastened to the side pieces 1a, 1b by means of rivet connections 4, 5.

However, this is not to exclude the fact that some of these space-retaining elements, e.g. 3, can be designed as threaded bolts with space retainers, such as small tubes, inserted between the side pieces 1a, 1b.

Further, in an embodiment essential to the invention the side pieces 1a, 1b display connection bolts 24, 25 at both ends 28, 29.

This measure also serves to allow the insertion, according to choice, of a loop-free strap end 32 from either of the two ends 28, 29 of the ratchet into the latter and the connection to the opposite end, in each case, of the strap end 35 having the loop, or vice versa.

Further, in an embodiment under each of the connection bolts 24, 25 is arranged in each case a second, thinner bolt 26, 27, forming in each case a guide slot 30, 31 for the strap ends 32 and 35, this second bolt being arranged in a parallel, spaced-apart manner.

This measure also serves to allow the free choice of the strap end 32 or 35 to be inserted from the right (e.g. Fig. 1) or likewise from the left, or vice versa.

Here, in each case the connection bolt 24, 25 is appropriately substantially larger in diameter than the second bolt 26, 27, and arranged in approximately the center

region of the width "B" of the side piece 1a, 1b, while the second bolts 26, 27 are arranged in the lower region of the side pieces 1a, 1b.

Further, in an embodiment a space-retaining element 3 is designed with a guide 6 for the reverse-motion locking pawl 7 that is displaceably arranged in the frame part 10.

Further, in an embodiment essential to the invention, in which the ratchet wheel 20 of the ratchet wheel lock 15 is formed with unidirectional teeth 8, the diameter ratio of the shell circle 21 to the root circle 22 of the teeth 8 amounts to between 1.1 and 1.2, and preferably 1.16666. From this results an angular distance between two neighboring teeth 8a, 8b, in each case, of between 15° and 18° (Fig. 4).

Further, the center point "M" of the bores 9a, 9b for supporting the strap winding shaft 23 is advantageously arranged on a line x-x (Fig. 3) that runs substantially at the level of the top edge 11 of the side pieces 1a, 1b.

As a consequence of the arrangement thus made, the ratchet wheel 20 can have a diameter that is substantially larger, in relation to the height of the ratchet, than was usual or possible until now in the known ratchets.

From this results in addition the advantage essential to the invention that, through the increased number of teeth 8a, 8b, etc. with a relatively unchanged tooth shape and depth, the angular distance from tooth to tooth 8a, 8b can be reduced to 18° or 15°, as the case may be, from the approximately 33° in the known designs of ratchets, and this without the additional expense of, for example, a known double ratchet wheel lock. Resulting from this is the possibility, in a ratchet of uncomplicated design, of an optimal tightening power in the use of the ratchet

In a further embodiment, wherein the guide link 12a, 12b displays at one end 18 of its divided-circle shaped embodiment a catch recess 13 for fixing the actuating hand-lever 14 in the neutral position when the lock 15 of the strap winding shaft 23 is released by means of the pawl 16 that can be engaged in the catch recess 13, the guide link 12a, 12b displays at the other end 19 of its divided-circle shaped embodiment a second catch recess 17 for fixing the actuating hand-lever 14 in its

actuating end-position.

Through this means, the hand-lever 14 can be locked fast in each of its end positions, which, in consideration of the directional reversal of the ratchet in the strap running direction possible according to the invention, is an essential advantage and increases the security, for example during transport.

The ratchet according to the invention is uncomplicated in structure, is reversible in the direction of connection at will, and makes possible, as a consequence of the special embodiment of the ratchet wheel and its distribution of teeth, an optimal utilization of the actuation force in the ergonomically best conditions.

To this extent, an ideal solution of the task stated at the beginning can be spoken of.

REFERENCE NUMERAL LIST

1. side pieces
2. space retainer
3. space retainer
4. rivet connection
5. rivet connection
6. guide
7. reverse-motion locking pawl
8. tooth
9. bore
10. frame part
11. top edge
12. guide link
13. catch recess (first)
14. actuating hand-lever
15. lock
16. pawl
17. catch recess (second)
18. one end of the link
19. other end of the link
20. ratchet wheel
21. shell circle
22. root circle
23. strap winding shaft
24. bolt
25. bolt
26. second bolt
27. second bolt
28. one end
29. other end
30. guide slot
31. guide slot

32. strap
33. strip-shaped formed part
34. tube part
35. strap end

CLAIMS

1. Ratchet for tightening, especially of lashing straps, with a frame part having a pair of side pieces arranged normally spaced-apart at both sides of a bridge element formed as one piece with the side pieces, which side pieces have bores for the rotationally-movable support of a strap winding shaft with a slot, which strap winding shaft works together with, on the one hand, a swingable actuating hand-lever and, on the other hand, with a ratchet wheel lock, wherein each support bore is formed at the top and toward the outside with a divided-circle shaped guide link for a pawl that is displaceably arranged in the actuating hand-lever, and in the frame part a likewise displaceably-arranged reverse-motion locking pawl is present,
characterized in that
the side pieces (1a, 1b) are connected fixedly to each other at the frame part (10) without arrangement of the single-piece bridge element, but rather through at least two space-retaining elements (2, 3) formed as multiple pieces with the side pieces (1a, 1b).

2. Ratchet according to claim 1, characterized in that the space-retaining elements (2, 3) are attached to the side pieces (1a, 1b) by means of rivet connections (4, 5).

3. Ratchet according to claims 1 and 2, characterized in that the side pieces (1a, 1b) display connection bolts (24, 25) at both ends (28, 29).

4. Ratchet according to one of the claims 1 through 3, characterized in that underneath each of the connection bolts (24, 25) is arranged in each case a second bolt (26, 27), forming a guide slot (30, 31) for the strap (32), said arranging being in a parallel, spaced-apart manner.

5. Ratchet according to one of the claims 1 through 4, characterized in that the connection bolts (24, 25) are substantially larger in diameter than the second bolts (26, 27) and are arranged approximately in the region of the central breadth of the side pieces (1a, 1b), and the second bolts (26, 27) are arranged

in the lower region of the side pieces.

6. Ratchet according to claims 1 and 2, characterized in that a space-retaining element (3) is designed with a guide (6) for the reverse-motion locking pawl (7) that is displaceably arranged in the frame part (10).

7. Ratchet according to one of the claims 1 through 6, wherein the ratchet wheel (20) of the ratchet wheel lock (15) is designed with unidirectional teeth (8), characterized in that the diameter ratio of the shell circle (21) to the root circle (22) of the teeth (8) is between 1.1 and 1.2, and preferably 1.16666.

8. Ratchet according to one of the claims 1 through 7, characterized in that the angular distance between two neighboring teeth (8a, 8b) in each case is between 15 and 18 angular degrees.

9. Ratchet according to one of the claims 1 through 8, characterized in that the center point (M) of the bore (9a, 9b) is arranged on a line (x-x) that runs substantially at the level of the top edge (11) of the side piece (1a, 1b).

10. Ratchet according to one of the claims 1 through 9, wherein the guide link (12) displays at one end (18) of its divided-circle shaped embodiment a catch recess (13) for fixing the actuating hand-lever (14) in the neutral position when the lock (15) of the strap winding shaft (23) is released by means of the pawl (16) that can be engaged in the catch recess (13), characterized in that the guide link (12) displays at the other end (19) of its divided-circle shaped embodiment a second catch recess (17) for fixing the actuating hand-lever (14) in its actuating end-position.

11. Ratchet according to one of the claims 1 through 10, characterized in that the diameter of the shell circle (21) of the ratchet wheel (20) is double the width (2 x B) of a side piece (1a, 1b).

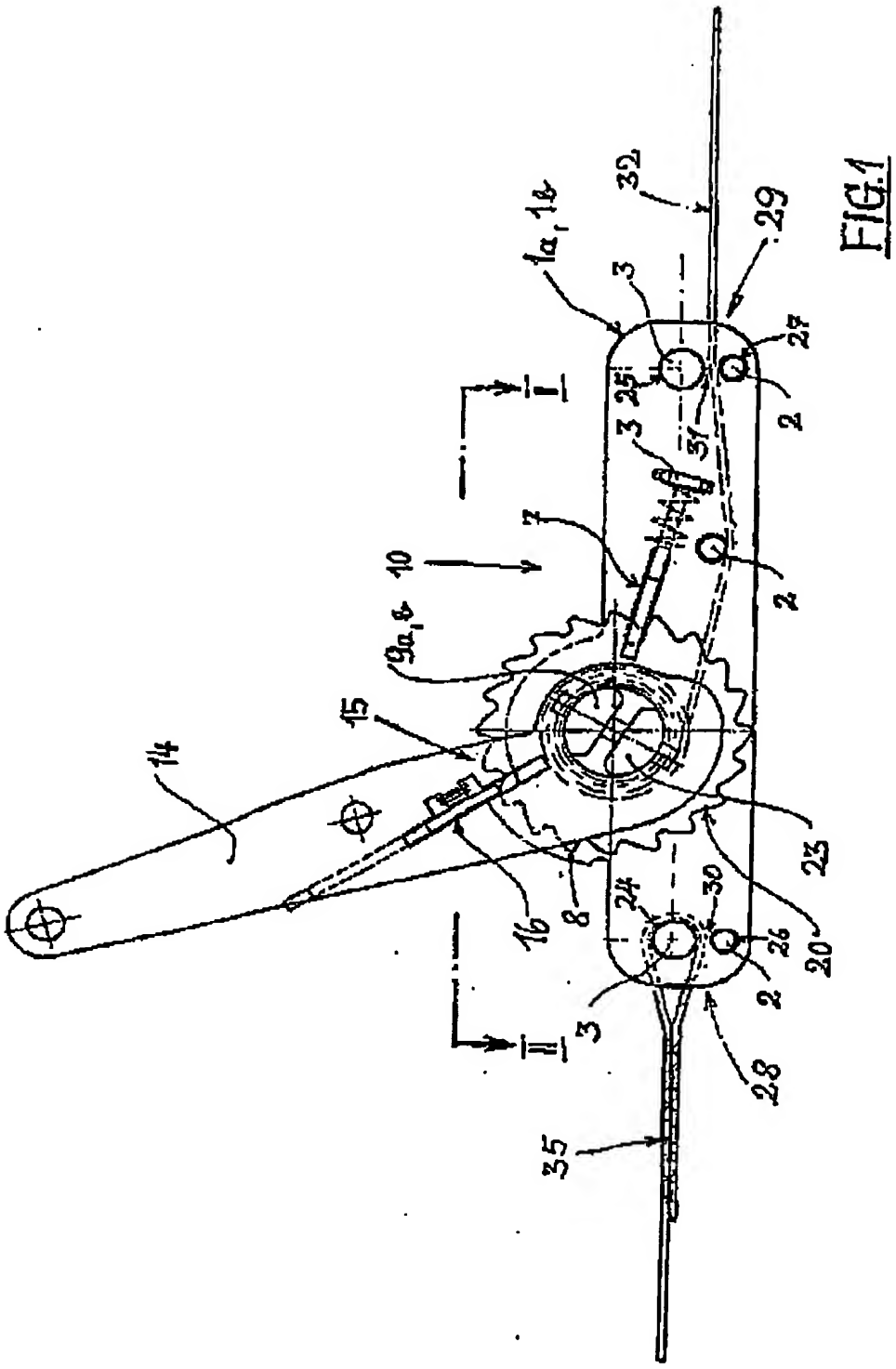


FIG.1

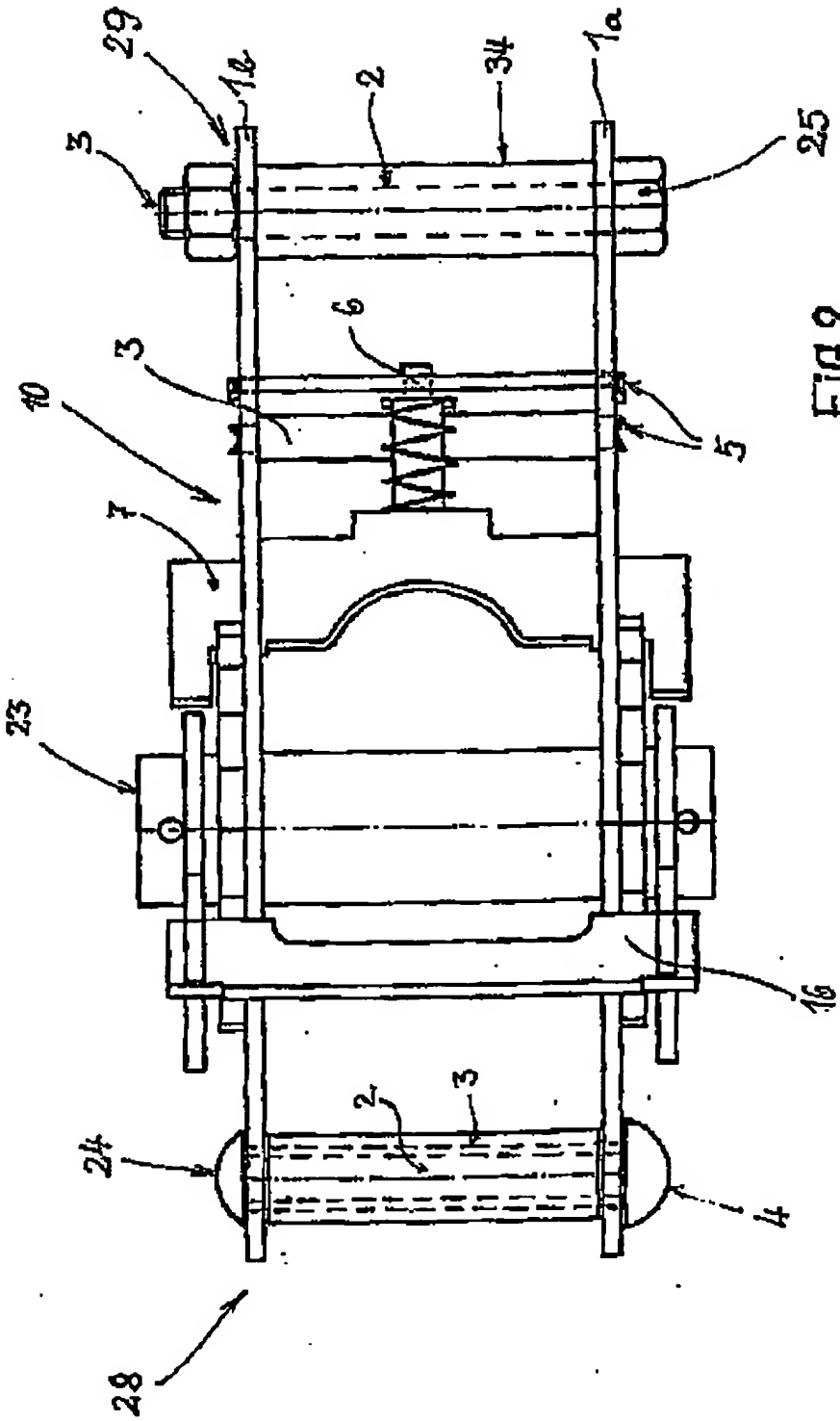


FIG.2

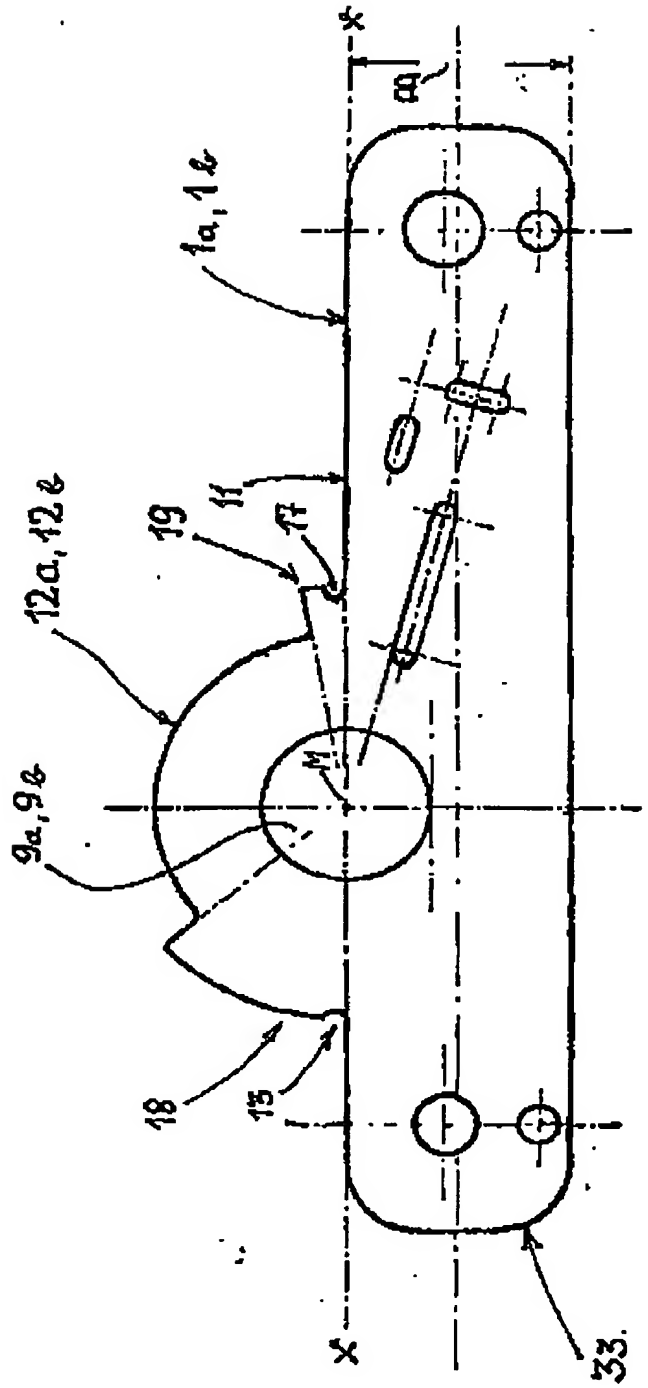
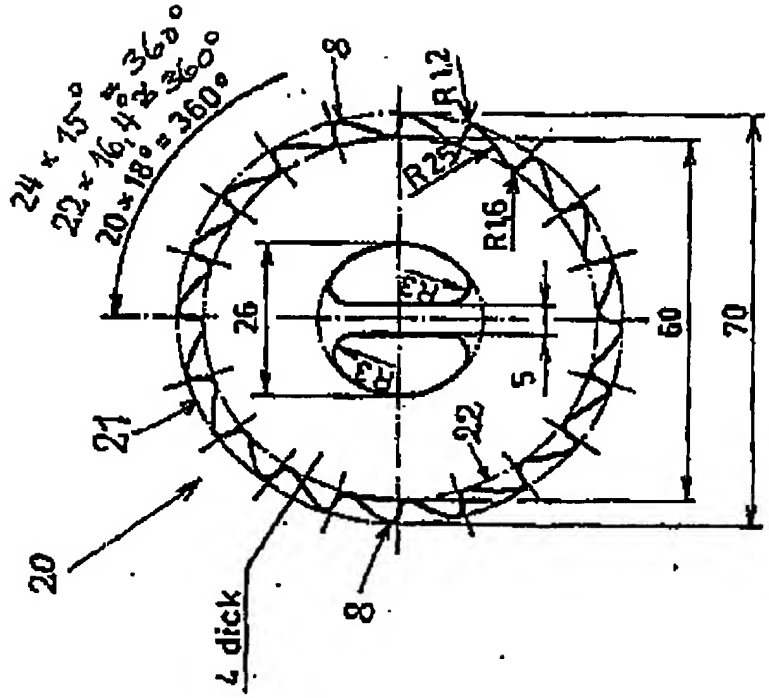


Fig3

Fig.4


24 x 15° = 360°
22 x 16,4° = 360°
20 x 18° = 360°
8
R12
R25
R16
26
60
70
5
22
21
20
8
4 dick

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Application for examination has been entered according to §44 of the Patent Law.

(54) **TIGHTENING RATCHET FOR LASHING STRAPS**

DE 30 17 371 A1

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PLEASE SPECIFY OUR REFERENCE:
1 / 13 (80179)
NUREMBERG, 6 MAY 1980

3017371

SpanSet Inter AG, Basel, Switzerland

Claims:

1.) Tightening ratchet with a slotted shaft rotatably supported on a tightening frame for tightening of a loose strap and with a tightening lever rotatably supported on the slotted shaft:

1. The slotted shaft is fixedly connected to the ratchet wheel of a ratchet lock.
2. Supported on the tightening lever is a pawl (tightening slide), which
   2.1 engages the toothing of the ratchet wheel under spring pressure and
   2.2 blocks the rotational movability of the tightening lever relative to the slotted shaft in the tightening direction.
3. Supported on the tightening frame is a pawl (holding slide), which
   3.1 engages the toothing of the ratchet wheel under spring pressure and
   3.2 blocks the rotational movability of the slotted shaft relative to the tightening frame in the direction opposite to the tightening direction.
4. Arranged on the tightening frame is a first bridge that is parallel to the slotted shaft.
5. The lay-on side of the tightening frame runs approximately parallel to the tangent that runs through the first bridge and touches the peripheral side of the slotted shaft facing away from the tightening lever.

Characteristics:

6. The tightening frame (1) connecting the slotted shaft (2) and the first bridge (13) to each other is extended beyond the slotted shaft (2).
7. At the end of the extension arm (17) a bridge (18) running parallel to the slotted shaft (2) can be attached.
8. The first bridge (13) is provided with a guide slot (22).

2.) Tightening ratchet according to claim 1, characterized in that the first bridge (13) is removably attached to the tightening frame (1).

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ORIGINAL INSPECTED

3.) Tightening ratchet according to claim 1 or 2, characterized in that the distance (23) of the strap guiding slot (22) from the lay-on side (14) of the tightening frame (1) is approximately equal to the distance of the second bridge (18) from the lay-on side (14) of the tightening frame (1).

4.) Tightening ratchet according to one or several of the preceding claims, characterized in that at least one of the bridges (13, 18) is formed as a bolt with a slot passing through in the direction of its longitudinal axis.

5.) Tightening ratchet according to one or several of the preceding claims, characterized in that at least one of the bridges (13, 18) is removably attached to the tightening frame (1), especially fastened by screw.

6.) Tightening ratchet according to one or several of the preceding claims, characterized in that at least the bridge (13) provided with a strap guiding slot (22) is attachable to the tightening frame (22) so as to be rotatable around a spindle that is parallel to the slotted shaft (2).

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Tightening Ratchet for Lashing Straps

The invention relates to a tightening ratchet with the features of the preamble of claim 1.

In a known tightening ratchet of the type stated above, the first bridge serves exclusively the connection of the tightening ratchet to a belt band or to the fixed end of the lashing strap to be tightened. In order to turn the slotted shaft and to tighten the belt or the loose end of the lashing strap pulled through the slot of the slotted shaft, the tightening lever is always swung in one direction, namely in the direction away from the first bridge. The fact that the actuation direction of the tightening lever is only possible towards one side can be disadvantageous in certain application cases of the tightening ratchet.

The invention, in contrast, is based on the task of developing a tightening ratchet, of the type stated at the beginning, in such a way that its slotted shaft, according to the manner of its installation, is rotated during the swinging of the tightening lever either in the direction toward the fastened strap end – in the following called "fixed strap" for short – or in the direction away from the fixed strap, in order to tighten the strap pulled through by the slotted shaft – which strap is called the "loose strap" in the following. This task is achieved through the characterizing portion of claim 1.

To be able to use the tightening ratchet in such a way that, through the swinging of the tightening lever, the slotted shaft of the ratchet is turned or tightened in a direction towards the fixed strap, requires merely that an additional bridge be attached for installation into the fixed strap at the end of the extension arm, and that the first bridge be provided with a strap guide slot. The loose strap is guided through the strap guide slot before it is pulled through the slot of the slotted shaft. If now the tightening lever is swung in the direction of the fixed strap and thereby the slotted shaft is rotated in the tightening direction, then the slot guide ensures that the loose

strap, or rather, the loose end of the lashing strap is aligned in the intake region in the tightening frame in a manner approximately parallel to the lay-on side of the tightening frame or in approximately a straight line with the longitudinal course of the end of the fixed strap. In addition, the slot guide prevents, during the swinging of the tightening lever in this installation position, the rotation of the tightening frame together with the tightening lever. Thus, through the strap guiding slot, the strap-guiding end of the tightening frame is, to a certain degree, fixed at the tightened region of the loose strap or the loose end of the lashing strap.

Through the characterizing portion of claim 2, a first, conventional bridge can be easily replaced with such a bridge having a guide slot.

Through the characterizing portion of claim 3, it is ensured that the fixed strap and the loose strap in their adjoining region at the tightening ratchet run approximately on a straight line that is itself aligned approximately parallel to the lay-on side of the tightening frame, whereby the tightening frame rests with its lay-on side fully or flat on the goods to be lashed and is not tilted with respect to the surface of the lashed goods during the lashing, which tilting could cause damage to the surface region of the lashed goods.

In the embodiment according to claim 4, the slot guide and the bridge are formed in such a way that they can be used, according to choice, for forced guiding of the loose strap or for insertion into the fixed strap. If the tightening ratchet is to be installed in the fixed strap for operation in the conventional course of movement, then indeed no bridge at all need be attached to the end of the extension arm. If, however, an installation for a reversed course of movement, according to the invention, is desired in the tightening of the lashing strap, this requires in addition only that an additional bridge or bolt be attached at the end of the extension arm, which bridge or bolt now serves for insertion into the fixed end of the lashing strap, while the first, slotted bridge serves for guiding the tightened end of the loose strap.

Through the characterizing portion of claim 6, the rotational position of the bridge and/or slot guide can automatically adjust to the tightening direction of the fixed and/or loose strap.

An embodiment example of the inventive object is explained in detail with the aid of the figures. In the drawings:

Fig. 1 shows a perspective view of a tightening ratchet of conventional design, by the aid of which the basic functioning of a tightening ratchet is explained,

Fig. 2 shows a side view of a tightening ratchet formed according to the invention, viewed in the direction of arrow II in Fig. 1 in the tightened position of the fixed strap and loose strap,

Fig. 3 shows a side view similar to Fig. 2 wherein the tightening frame of the tightening ratchet, in order to reverse the movement course during the tightening of the slotted shaft, is inserted into the end of the fixed strap by the end of the extension arm,

Fig. 4 shows a schematic representation of the guiding of the loose strap in the installation of the tightening ratchet according to Fig. 3, and

Fig. 5 shows a side view of the tightening ratchet according to the invention in a swung-up position of the tightening lever, wherein the blocking of the rotational movability of the slotted shaft relative to the tightening frame is canceled by force.

The tightening ratchet represented in Fig. 1 consists in essence of the tightening frame 1, the slotted shaft 2 rotatably supported at the front end of the tightening frame 1 for tightening the loose end 3 of the lashing strap or of the loose strap 3, and the tightening lever 4 rotatably supported on the slotted shaft 2. The slotted shaft 2 is fixedly connected at both ends in each case to a ratchet wheel 5 of a ratchet lock. Supported on the tightening lever 4 is a first pawl, which in the following is called the "tightening slide 6" for short. The tightening slide 6, under the pressure of the spring 7 supported on the tightening lever 4, engages with its prong-like ends 9 the toothing 8 of the ratchet wheel 5 and blocks the rotational movability of the tightening lever 4 in relation to the slotted shaft 2 in the tightening direction 12.

On the tightening frame 1, a second pawl – in the following called the "holding slide 10" for short – is supported so as to be displaceable in the direction of the toothing 8 of the ratchet wheel 5. The holding slide 10 is under the pressure of the spring 11 supported on the tightening frame 1, which spring presses the holding slide against the toothing 8 of the ratchet wheel 5. Upon the falling of the holding slide 10 into the toothing 8 of the ratchet wheel 5, the rotational movability of the slotted shaft 2 in relation to the tightening frame 1 is blocked in the tightening direction 12 of the tightening lever 4.

Arranged on the rearward end of the tightening frame 1 is a first bridge 13, which runs parallel to the slotted shaft 2. The lay-on side 14 of the tightening frame 1 runs approximately parallel to the tangent 16 that runs through the first bridge 13 and touches the peripheral side 15, facing away from the tightening lever 4, of the slotted shaft 2.

The tightening frame 1 connecting the slotted shaft 2 and the first bridge 13 to each other is extended beyond the slotted shaft 2. Attachable at the end of the extension arm 17 is a bridge 18 likewise running parallel to the slotted shaft 2, for which corresponding bores 19 are placed in the side pieces 20 of the tightening frame 1. The first bridge 13 is provided with a guide slot 22 for the loose end of the lashing strap or the loose strap 3.

The first bridge 13 is removably attached to the tightening frame 1, which can be made possible through a screw connection. The distance of the guide slot 22 of the first bridge 13 from the lay-on side 14 of the tightening frame 1 is approximately equal to the distance of the bridge 18 attached to the extension arm 17 from the lay-on side 14 of the tightening frame 1. These distances are labeled as 23 in Fig. 3.

According to choice, both bridges 13, 18 can also be formed as bolts with slots passing through in the direction of the longitudinal axis. At least the first bridge 13 forming the guide slot can be supported so as to be rotatable in relation to the tightening frame around an axis that is parallel to the slotted shaft.

For conventional operation of the ratchet, the tightening frame 1 is inserted with the first bridge 13 into the fixed end of the lashing strap or into the fixed strap 24. In this case, the extension arm 17 and its bores 19 have no function. In order to lash tight the loose strap 3, the latter is pulled through the guide slot 22 of the slotted shaft 2 with the loose strap end 21 until a certain pre-tensioning, easily applicable by hand, is present on the goods to be lashed. Then the tightening lever 4 is swung back and forth multiple times in the tightening direction 12, i.e. away from the fixed strap 24, in a swinging range of approximately 120°. Thereby, the slotted shaft 2 is rotated. The loose strap 3 is tightened, the loose strap end being clamped firmly between the loose strap 3 and the slotted shaft 2 and thus not slipping out.

In the installation of the tightening ratchet according to Figs. 3 and 4, the tightening frame 1 is inserted with the bridge 18 provided on the extension arm 17 into the end of the fixed strap 24. The first bridge 13 displays a guide slot 22. The end 21 of the loose strap 3 is first pulled through the guide slot 22 (Fig. 4), before it is pulled through the shaft slot 26 of the slotted shaft 2. In order to tighten the slotted shaft 2 or rather the loose strap 3, the tightening lever 4 is swung back and forth in the alternative tightening direction 27 (Fig. 3), as this was described in detail in reference to Fig. 2. The alternative tightening direction 27 is towards the fixed strap 24. During this, the guide slot 22 of the first bridge 13 holds the loose strap 3 in a straight line with the alignment of the fixed strap 24, even though the loose strap 3 winds up on the peripheral side 28 of the slotted shaft 2 facing away from this straight line.

Fig. 5 shows the conventional manner of loosening the tightening ratchet located in the tightening position. For this, the tightening slide 6 is merely pulled out of its engagement with the toothing of the ratchet wheel 5 and the tightening lever 4 is swung through until the control cam 29 provided on its bearing periphery also pushes the holding slide 10 out of its engagement position in the toothing 8 of the ratchet wheel 5. Under the tension of the loose strap 3, the slotted shaft 2 then rotates far enough that the loose strap end 21 can be easily pulled out of the shaft slot 26.

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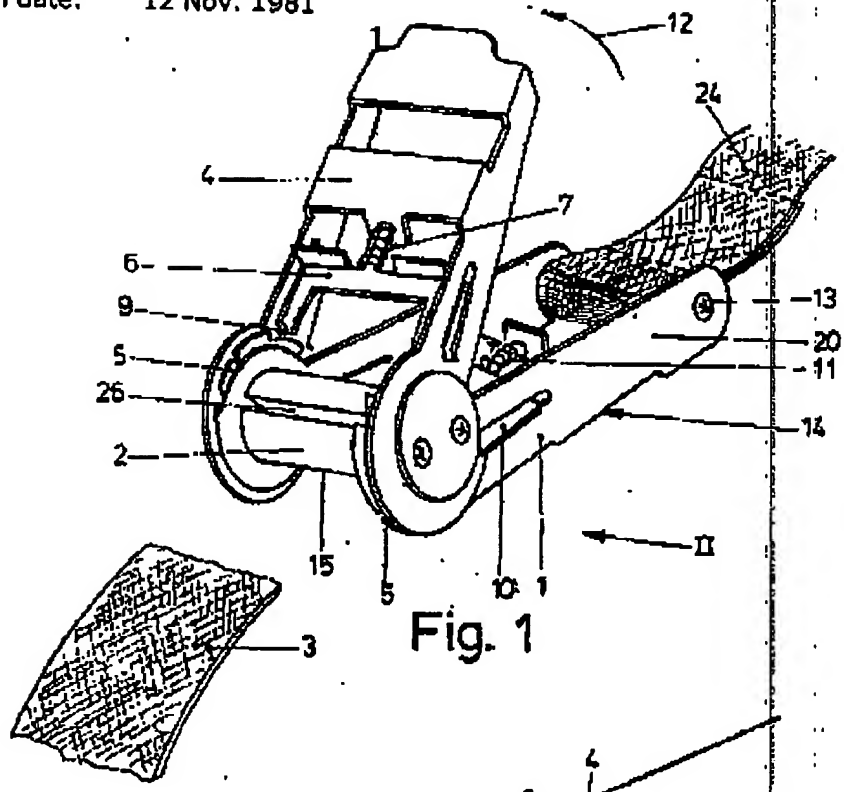

Fig. 1

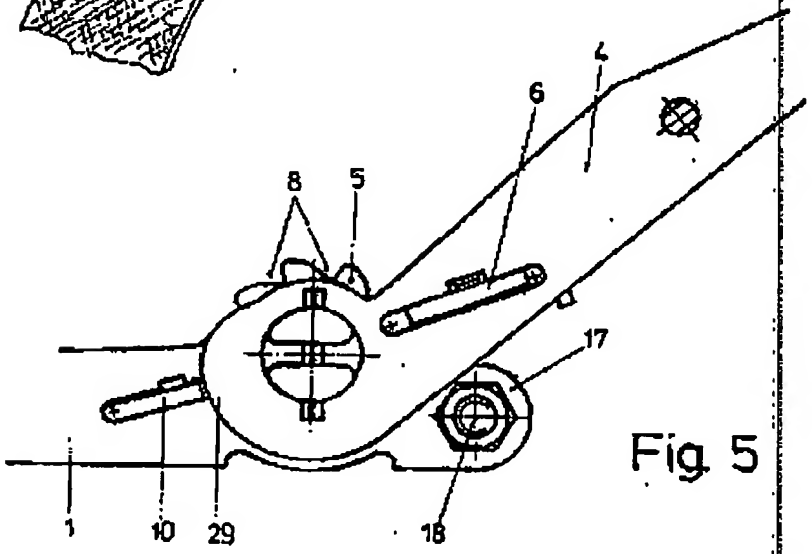

Fig. 5

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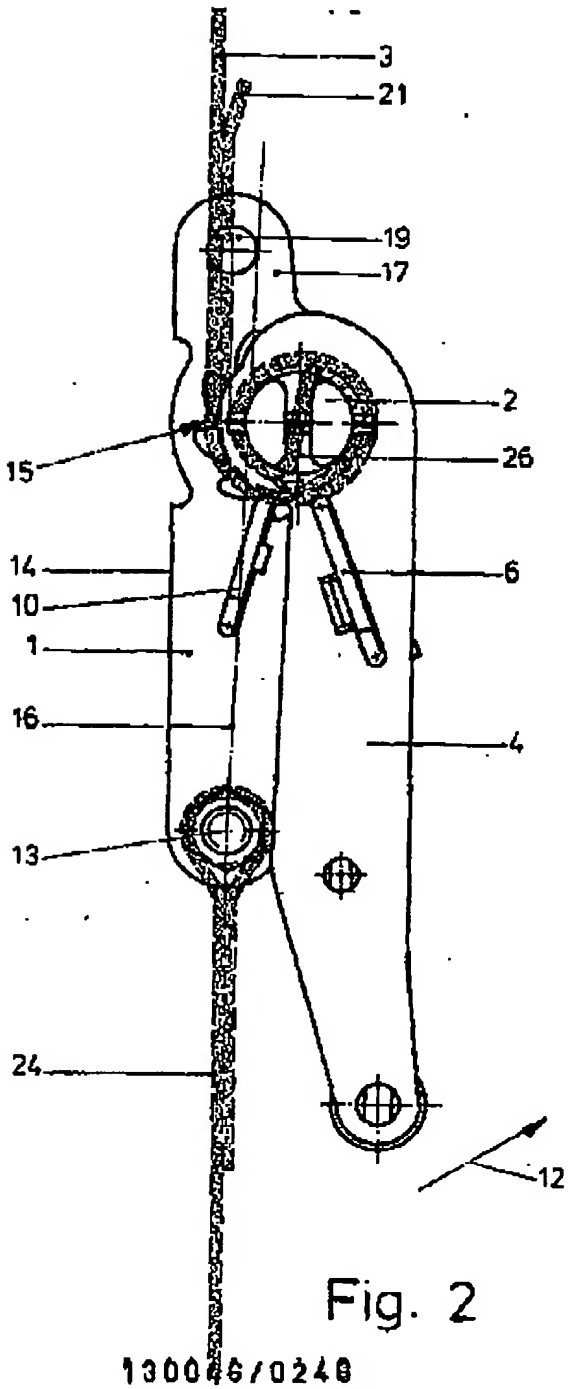

Fig. 2

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Fig. 3

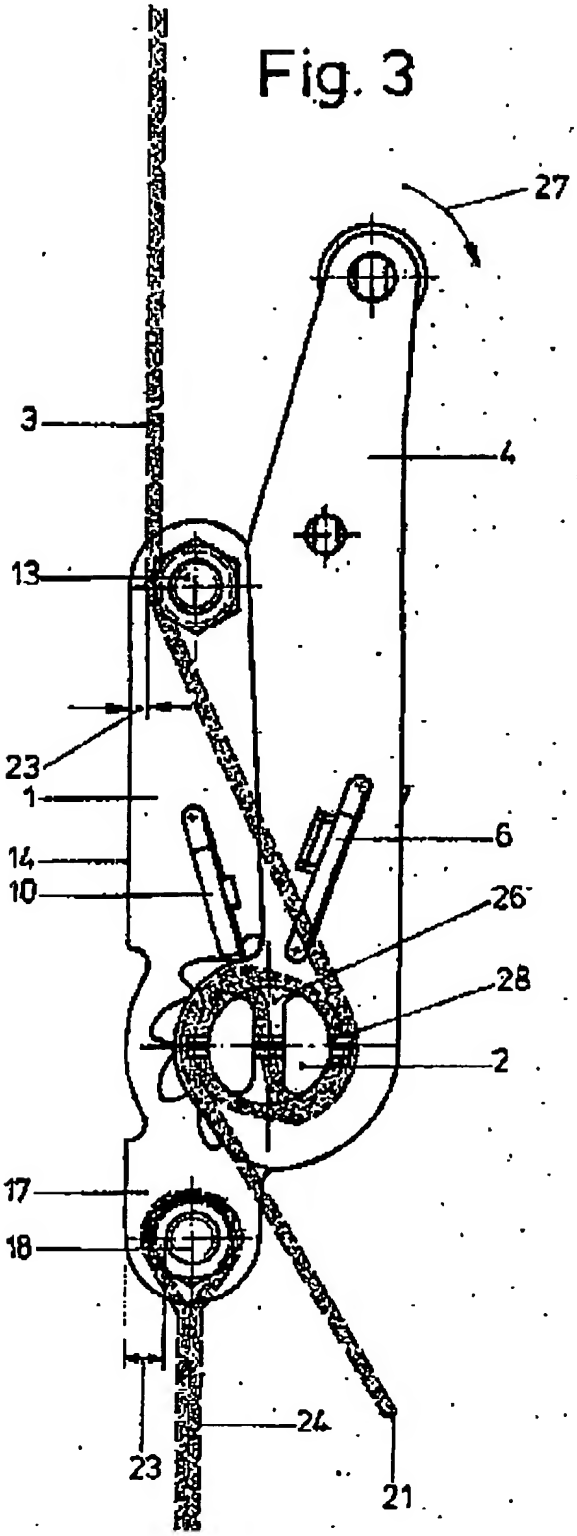

Fig. 4